(2)

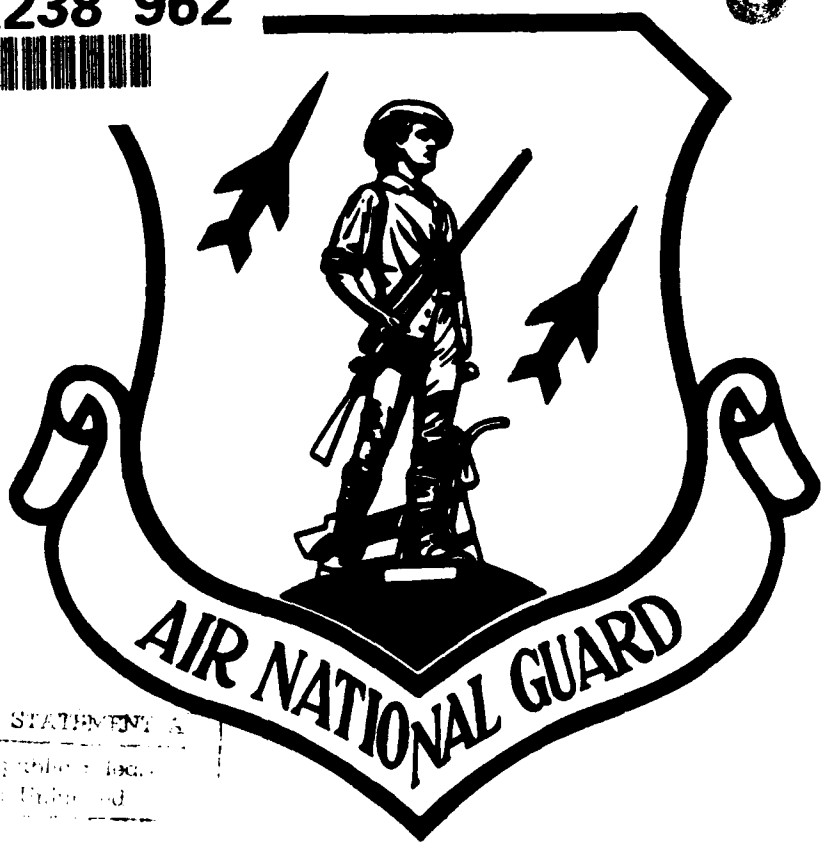
INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

162nd Combat Communications Group
and
149th Combat Communications Squadron

North Highlands Air National Guard Station
California Air National guard
Sacramento, California

January 1991



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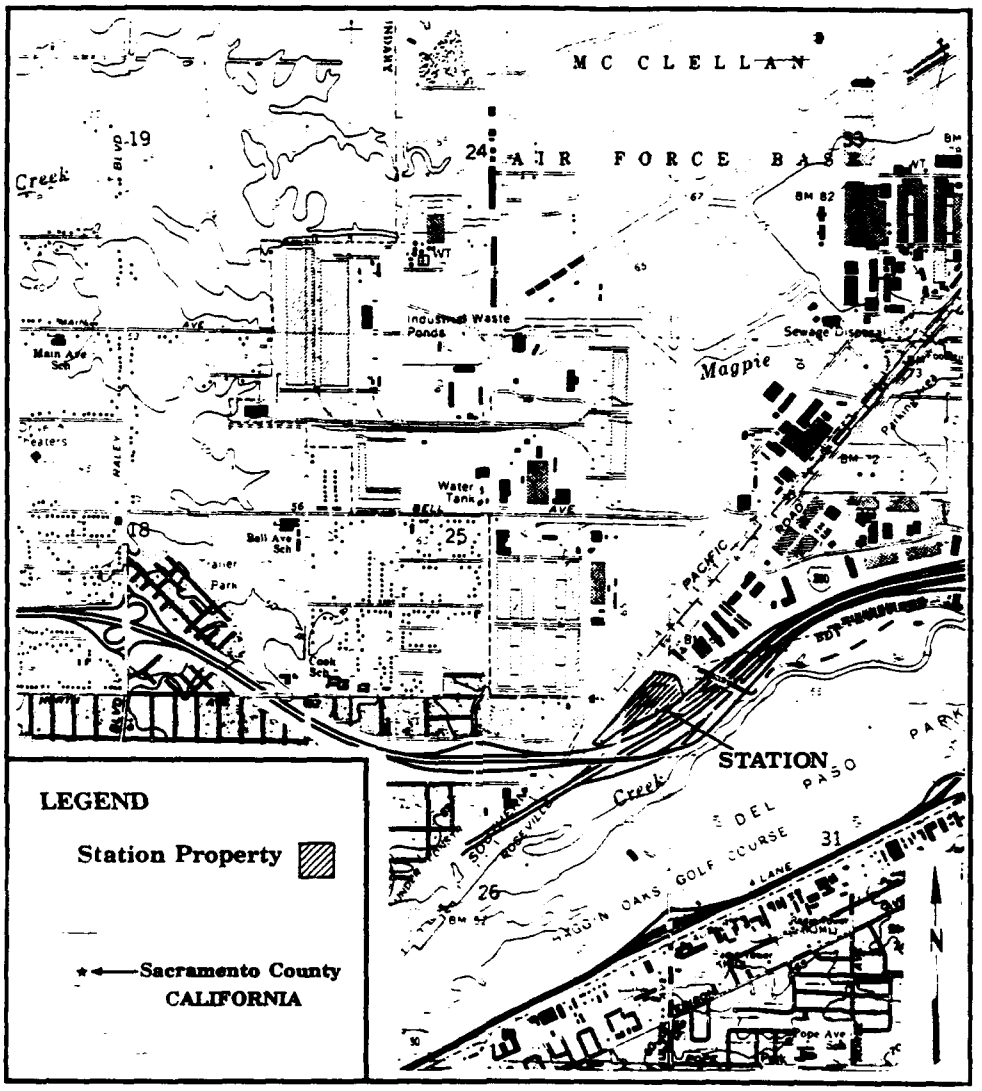

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Preliminary environmental assessment for the North Highlands Air National Guard Station, as part of the Installation Restoration Program. The report reflects data gathered from records review, interviews, and a site visit. Two sites were identified as potenially contaminated and recommended for furhter investigation.

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

162nd COMBAT COMMUNICATIONS GROUP
149th COMBAT COMMUNICATIONS SQUADRON
NORTH HIGHLANDS AIR NATIONAL GUARD STATION
CALIFORNIA AIR NATIONAL GUARD
SACRAMENTO, CALIFORNIA

Prepared for

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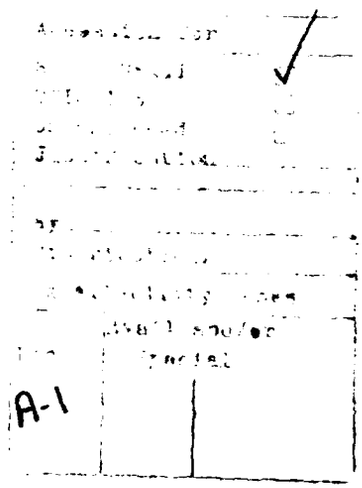

Submitted to

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Oak Ridge, Tennessee
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for the Department of Energy,
Under Contract DE-AC05-84OR21400

January 1991

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ACRONYM LIST

AFB	Air Force Base
AGE	Aerospace Ground Equipment
CCGP	Combat Communications Group
CCSQ	Combat Communications Squadron
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
HARM	Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
NDDB	Natural Diversity Data Base
NGB	National Guard Bureau
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
PL	Public Law
POC	Point of Contact
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
USAF	United States Air Force
USC	United States Code
UTA	Unit Training Assembly

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 162nd Combat Communications Group (CCGP) and the 149th Combat Communications Squadron (CCSQ), North Highlands Air National Guard Station [hereinafter referred to as the Station] located at Sacramento, California. For the purpose of this document, the Station shall include the total area leased by the 162nd CCGP and the 149th CCSQ at Sacramento, California.

The PA included the following activities:

- o an on-site visit, including interviews with a total of nine persons familiar with Station operations, and field surveys by SciTek representatives during April 23 through May 4, 1990;
- o acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;
- o acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and
- o the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 162nd CCGP and the 149th CCSQ have used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1950.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenance and maintenance of aerospace ground equipment (AGE). The hazardous wastes disposed of through these operations include varying quantities of fuels, acids, paints, thinners, strippers, solvents, and oils.

The field surveys and interviews resulted in two sites being identified that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are two sites where a potential for contaminant presence exists. These are as follows:

Site No. 1 - Old AGE Area (HAS - 58)

Site No. 2 - Area Behind Vehicle Maintenance (HAS - 58)

D. RECOMMENDATIONS

Further work under the IRP is recommended for the two identified sites to determine the presence or absence of contamination.

I. INTRODUCTION

A. Background

The 162nd Combat Communications Group (CCGP) and the 149th Combat Communications Squadron (CCSQ), North Highlands Air National Guard Station [hereinafter referred to as the Station] is located at Sacramento, California. The 162nd CCGP and the 149th CCSQ have been active at their present location since 1950. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality 1Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law (PL) 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via an Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

- **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

  The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to

provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

1. **No Further Action** - Investigations do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document will be prepared to close out the site.

2. **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an

installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

- **Research and Development**

Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

- **Immediate Action Alternatives**

At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Station property.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

- an on-site visit and field surveys during the period April 23 through May 4, 1990;
- acquisition of records and information on hazardous materials use and waste handling practices;
- acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;
- a review and analysis of all information obtained; and
- preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Ray S. Clark, Civil/Environmental Engineer; Mr. P. J. McMullen, Geologist/Hydrogeologist; and Mr. Jack D. Wheat, Geologist. Ms. Carol Ann Beda of the NGB is Project Officer for this Station and participated in the overall assessment during the Station visit. Ms. Beda was accompanied by Mr. Gary Hinkle of the NGB. Mr. Bob Combs of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the Station visit.

The point of contact (POC) at the Station was Major Carl H. Gericke (Group Civil Engineer).

D. Methodology

The PA began with a visit to the Station to identify all operations that may have utilized hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

A total of nine current and past Station employees familiar with the various operating procedures were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 22 years and ranged from 11 to 32 years. Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal and state agencies. A listing of federal and state agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, two potential sites were identified to be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored and assigned a Hazard Assessment Score (HAS) using the Air Force Hazard Assessment Rating Methodology (HARM). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather, may indicate a lack of data. A description of HARM is presented in Appendix B.

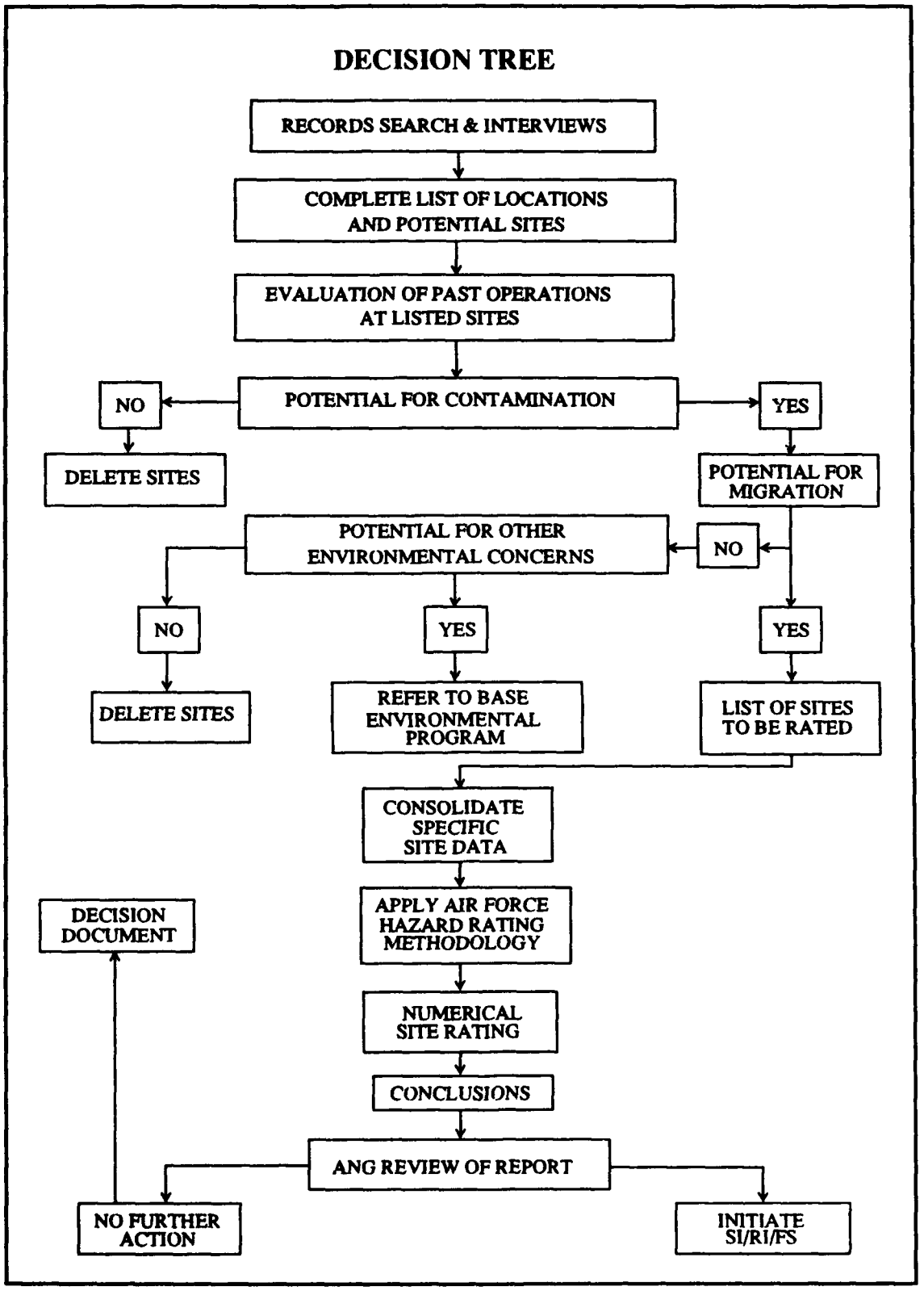


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

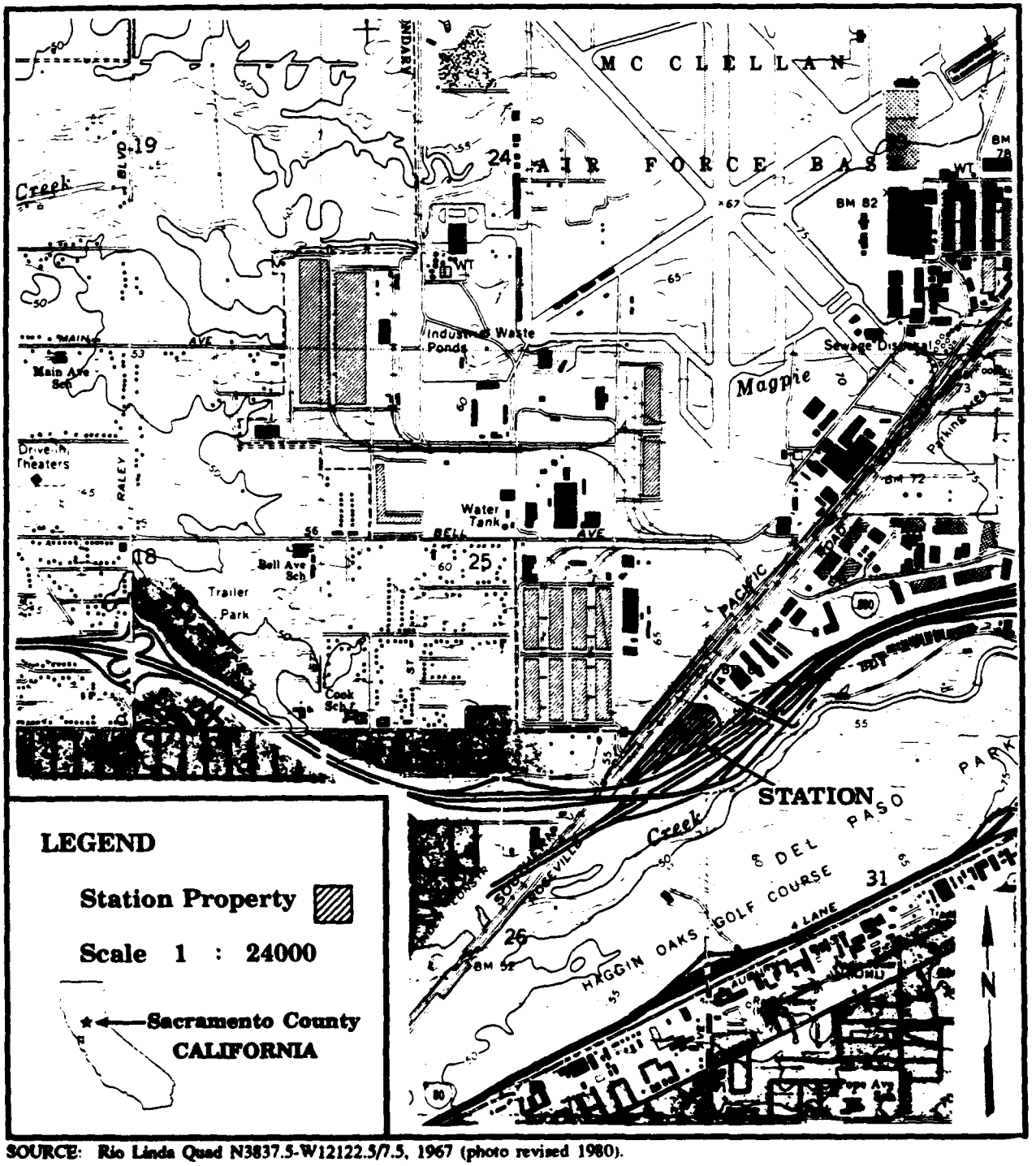
The Station is located approximately 6 miles northeast of downtown Sacramento and is adjacent to McClellan Air Force Base (AFB) within Sacramento County, California. The major route to the Station is the Sacramento Freeway (I-80).

The Station occupies approximately 8 acres north of I-80 and is just south of McClellan AFB on Roseville Road. The Southern Pacific Rail Road is located approximately 100 feet north of the Station. Figure II.1 illustrates the location and boundaries of the Station. On weekdays, the population at the Station is approximately 28. Unit Training Assembly (UTA) occurs one weekend per month. The Station population during this weekend is approximately 240. The Station is completely fenced with controlled access. The unimproved acreage is used to conduct training and for parking of equipment.

B. Organization and History

The Station was originally constructed in 1950. Before then, the land was used for agriculture. Since 1950, the land has been occupied by the North Highlands Air National Guard. The principal buildings constructed in 1950 included Headquarters (Building 1) and the Vehicle Maintenance Shop (Building 4). Maintenance operations on vehicles, generators, etc., were necessary for the unit to fulfill its mission. The mission of the 149th CCSQ and the 162nd CCGP is to install, operate, and maintain mobile communicaton facilities providing interbase and intrabase communications in support of tactical air forces and state emergencies and has remained essentially the same over the years. Maintenance operations required the use and disposal of hazardous materials such as waste oils, fuels, solvents, thinners, and paints. Through the years such waste materials have usually been disposed of by a contractor or the Defense Reutilization and Marketing Office (DRMO) at McClellan AFB. However, small spills and other small releases of these wastes have occurred periodically at the Station.

In 1968 construction of Interstate 80 changed the boundaries of the Station. The acreage of the Station remained the same, but the shape changed somewhat. This construction also considerably changed the area behind the Vehicle Maintenance Shop. Before the interstate was built, there was a drainage area behind the Vehicle Maintenance Shop. Nearly all of the surface drainage from the Station emptied into this area. However, the construction of the interstate filled this area in and possibly relocated the soils. Furthermore, a concrete drainage ditch, which carries the surface water around



SOURCE: Rio Linda Quad N3837.5-W12122.5/7.5, 1967 (photo revised 1980).

Figure II.1

Location Map of
the North Highlands Air National Guard Station

the perimeter and empties into the city sewer on the north side of the Station, was installed.

As part of routine maintenance, the vehicles and ground equipment must be occasionally washed. Since 1980, the washing operations at the Station have taken place east of Building 9 and south of Building 4. Drainage from the washrack drains into an oil/water separator and into the sanitary sewer. Prior to 1980, the area next to Vehicle Maintenance (Building 4) was used for wash operations.

The gravel area on the west side of the Station was used as an AGE maintenance area until the AGE Shop (Building 9) was constructed in 1980. Once this building was finished all operations concerning the AGE equipment were moved from the gravel area into the new building.

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data is taken from Climatic Atlas of the United States (U.S. Department of Commerce, National Climatic Center, Asheville, N.C., 1979), and Climatography of the United States, No. 81 - California (U.S. Department of Commerce, National Climatic Center, Asheville, N.C., 1982).

North Highlands, which is located in the lower Sacramento Valley, enjoys a mild climate with warm, dry summer days. Because of the north-south orientation of the Central Valley, plus the deflecting effect of the bordering Coastal Ranges and the Sierra Ranges, the prevailing southerly Pacific Ocean winds provide an annual temperature of 61.4°F (1941-1983). The average monthly temperature ranges from 46.0°F in January to 76.1°F in July (4-7630, Sacramento WSO; 4-7633, Sacramento City WSO).

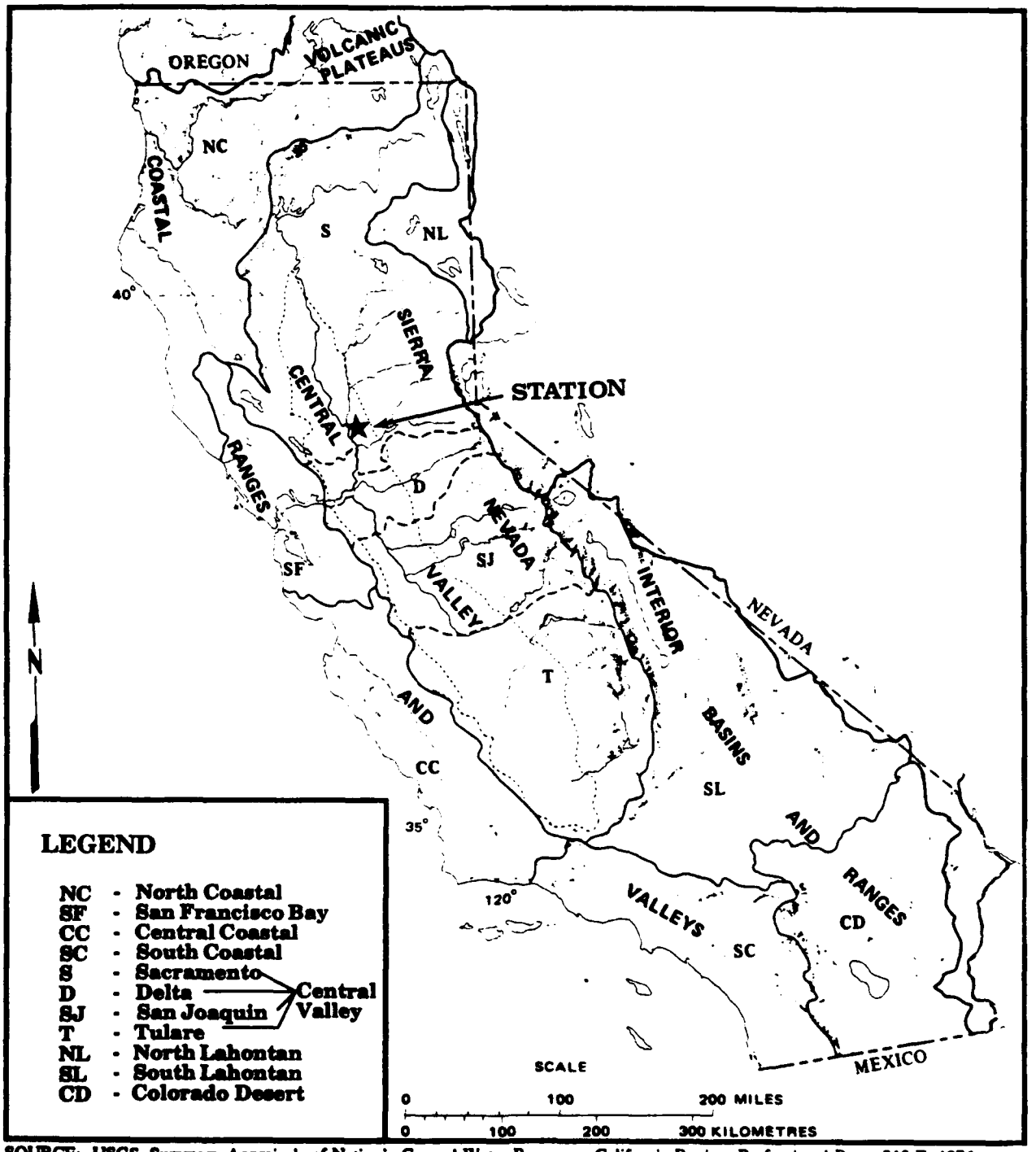
Since the western slopes of the Sierra Nevada are only 50 miles east of North Highlands, the heavy mountain snowfalls and rains can cause occasional flood conditions along the Sacramento River and its tributaries during the spring melt (April, May). The average annual precipitation, based on a 29-year record from 1951-1980, was 18.0 inches.

The net precipitation, which is the difference between the mean annual lake evaporation and the average annual precipitation, is -34 inches (47 FR 31224 July 16, 1982). The mean annual lake evaporation is 52 inches and the annual precipitation is 18 inches. Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 2.25 inches (47 FR 31235 July 16, 1982, Figure No. 8).

B. Geology

The Station has an elevation of 70 feet above mean sea level with gentle surface slopes of less than 1 degree per mile towards the west. It is located in the northern one-third of the Central Valley of California, which is termed the Sacramento Valley. The southern two-thirds of the Central Valley is referred to as the San Joaquin Valley (Figure III.1).

According to Hackel, 1966, the Central Valley (Great Valley) of California comprises approximately 20,000 square miles and extends from the California-Oregon border south for some 400 miles to the vicinity of Bakersfield. The average width is about 50 miles, and it is bordered on the east by the Sierra Nevada Mountains and on the west by the Coastal Range Mountains.



SOURCE: USGS, Summary Appraisals of Nation's Ground Water Resources-California Region, Professional Paper 813-E, 1976.

Figure III.1

Physiographic Map of California

Page, 1986, describes the Central Valley as a large, northwestward trending, asymmetrical structural trough that has been filled with as much as ten vertical miles of sediments. Along the flanks of the valley, which correspond to the flanks of the trough, deposits are generally thinner than those underlying the topographic axis of the valley (Figure III.2).

Sediments in the trough range in age from Jurassic to Holocene and include both marine and continental rocks and deposits. Granitic and metamorphic rocks crop out along most of the eastern flank while marine pre-Tertiary rocks crop out along most of the western flank (Coastal Range). Post-Eocene continental rocks and deposits constitute a heterogeneous mixture that contains most of the fresh groundwater in the Central Valley and crop out over virtually the whole valley. These continental deposits also overlie or contain saline water at depth.

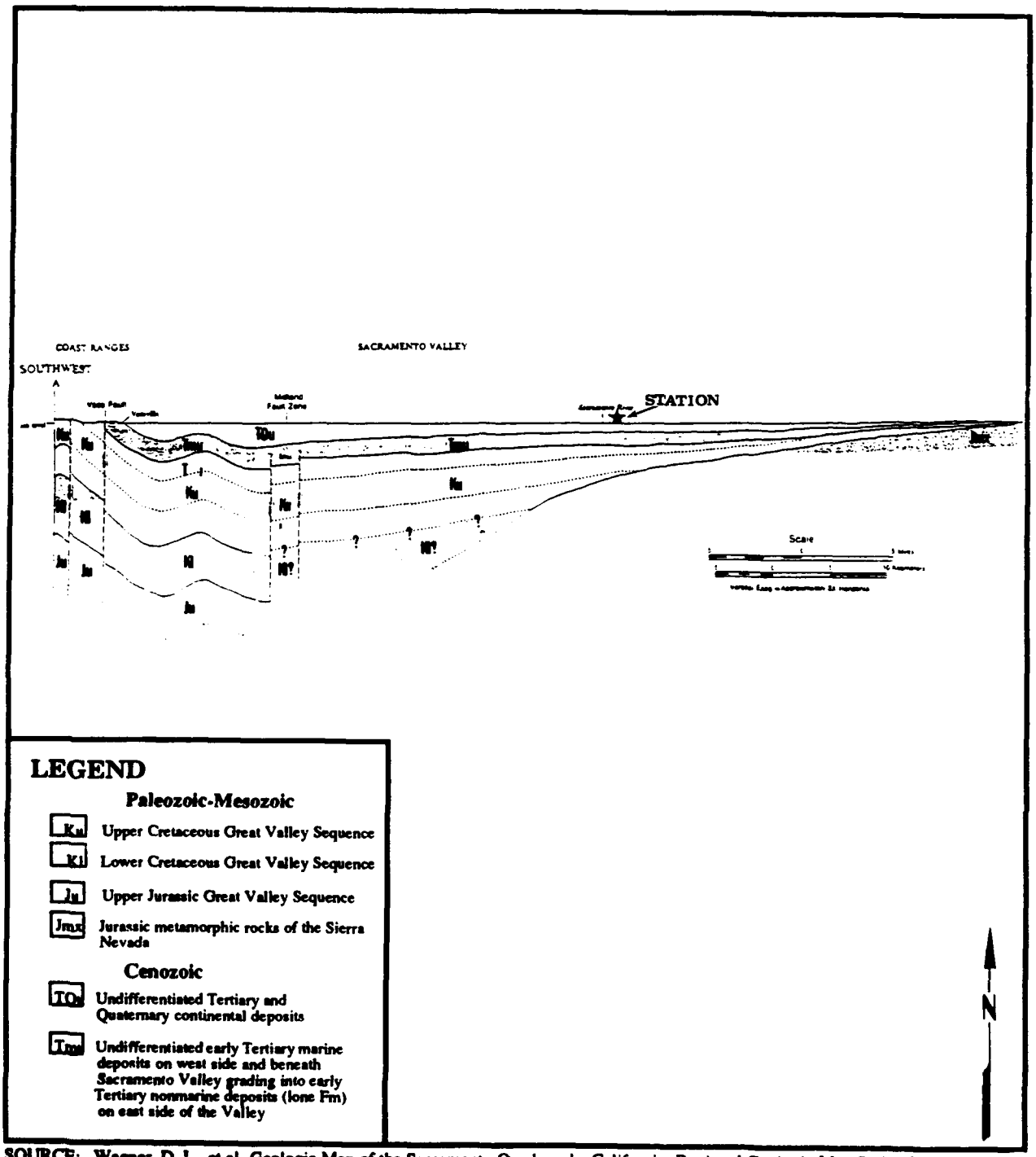
Beneath the San Joaquin sandy loamy soils, the Station is underlain by approximately 3000 feet of Pliocene to Holocene continental rocks and deposits that are a heterogeneous mix of poorly sorted clay, silt, sand, and gravel. Although it is difficult to determine subsurface contacts, formation names used are Red Bluff, Modesto, Riverbank, and Turlock Lake (Figures III.3, III.4).

The San Joaquin soil association is a moderately shallow sandy loam that occurs on gentle slopes (3 to 8 percent) in old valley plains cut by small drainageways. The surface soil averages 6 inches and is a light brown or reddish brown, strongly to medium acid sandy loam that dries out moderately hard. The upper subsoil extends to depths of 12 to 30 inches and is a light clay loam with slightly higher acid than the surface soil. The deeper subsoil is a reddish brown or brown, compact clay that becomes more gray/grayish and then turns olive gray immediately above the impervious hard pan layer which varies in depth from 15 to 42 inches below ground level. Surface soil permeability is moderate (4.45×10^{-4} cm/sec to 1.41×10^{-3} cm/sec), but subsoil/substratum permeability is very slow (less than 4.24×10^{-5} cm/sec). Erosion hazard is slight. The information pertaining to soils contained in the text was derived from the Soil Survey of Sacramento Area, California (United States Department of Agriculture, Soil Conservation Service, Series 1941, No. 11, August 1945).

C. Hydrology

1. Surface Water

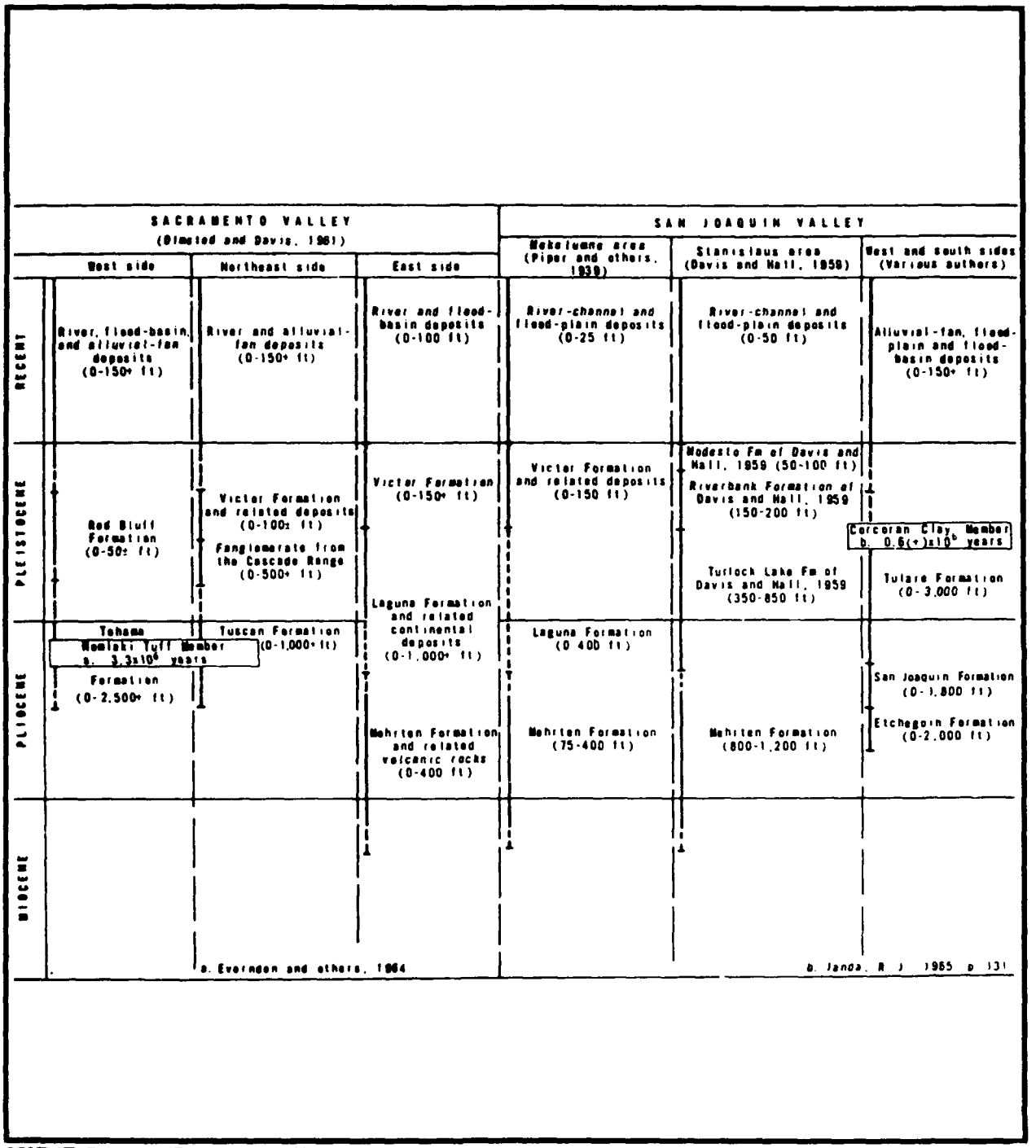
The Station is located in the Sacramento/American River drainage basin approximately five miles east of the intersection of the Sacramento and American Rivers. Surface flow off the facilities is through storm drains and/or directly into open ditches flowing westward toward this intersection (Figure III.5). Figure III.6 shows the areal drainage in the vicinity of the Station which has been classified as being outside the 100-year flood plain.



SOURCE: Wagner, D. L. et al, Geologic Map of the Sacramento Quadrangle, California, Regional Geologic Map Series, No. 1A, 1987.

Figure III.2

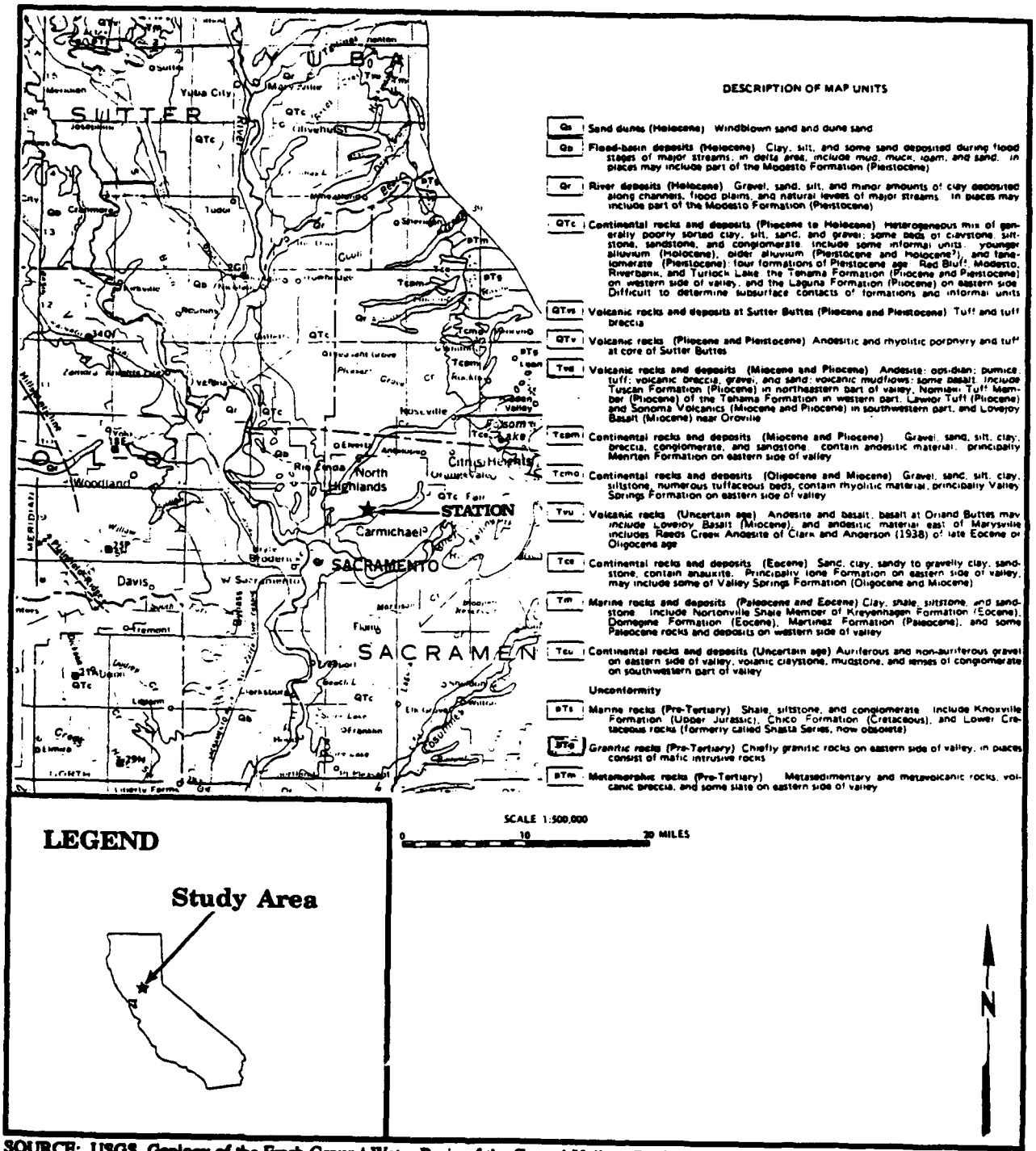
Diagrammatic Cross Section Across the Sacramento Valley



SOURCE: Poland and Evenson, Great Valley, p. 241, 1966.

Figure III.3

Generalized Stratigraphic Column of the Area

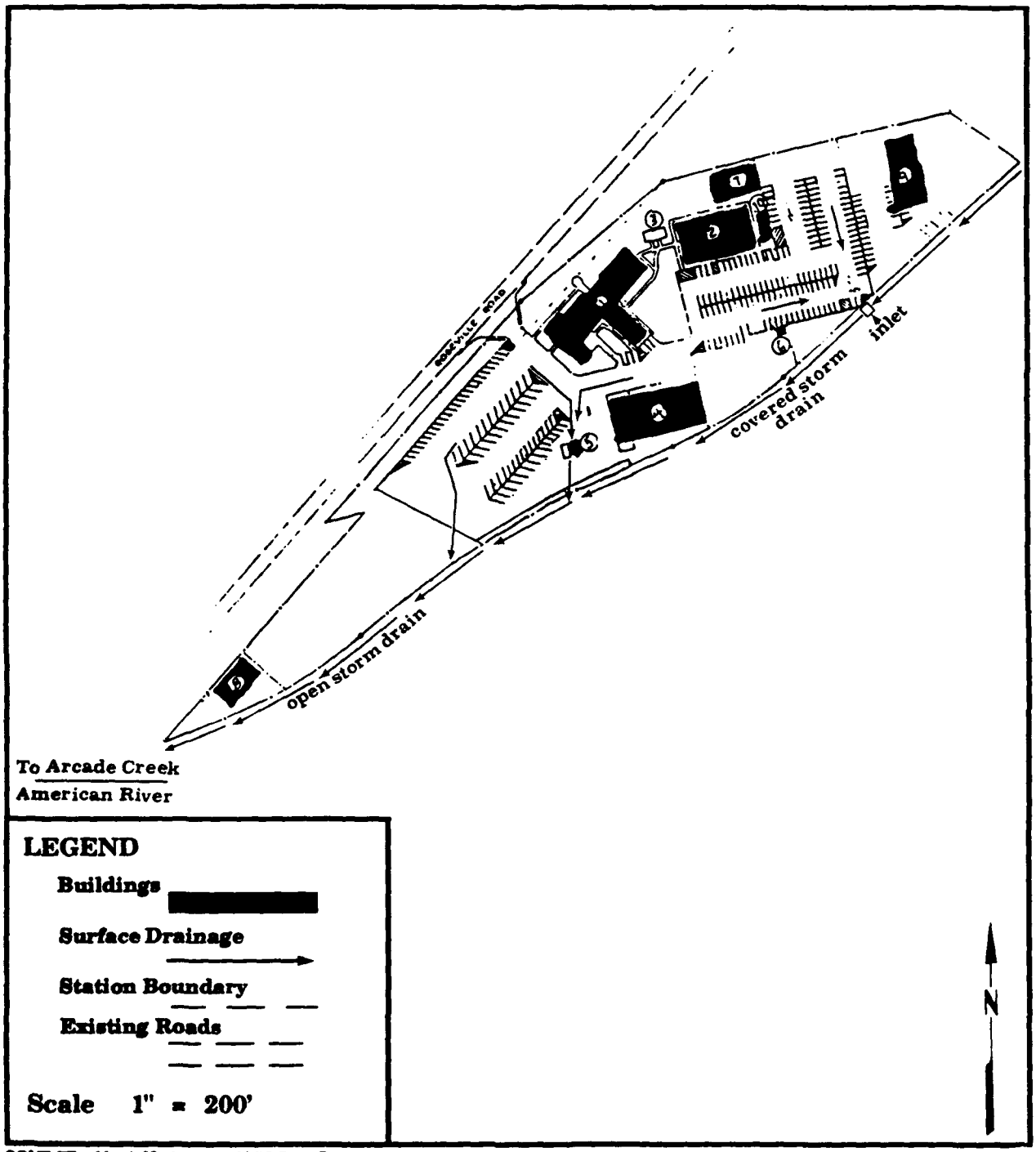


SOURCE: USGS, Geology of the Fresh Ground Water Basin of the Central Valley, California, Professional Paper 1401-C, 1986.

Figure III.4

Surficial Geologic Map

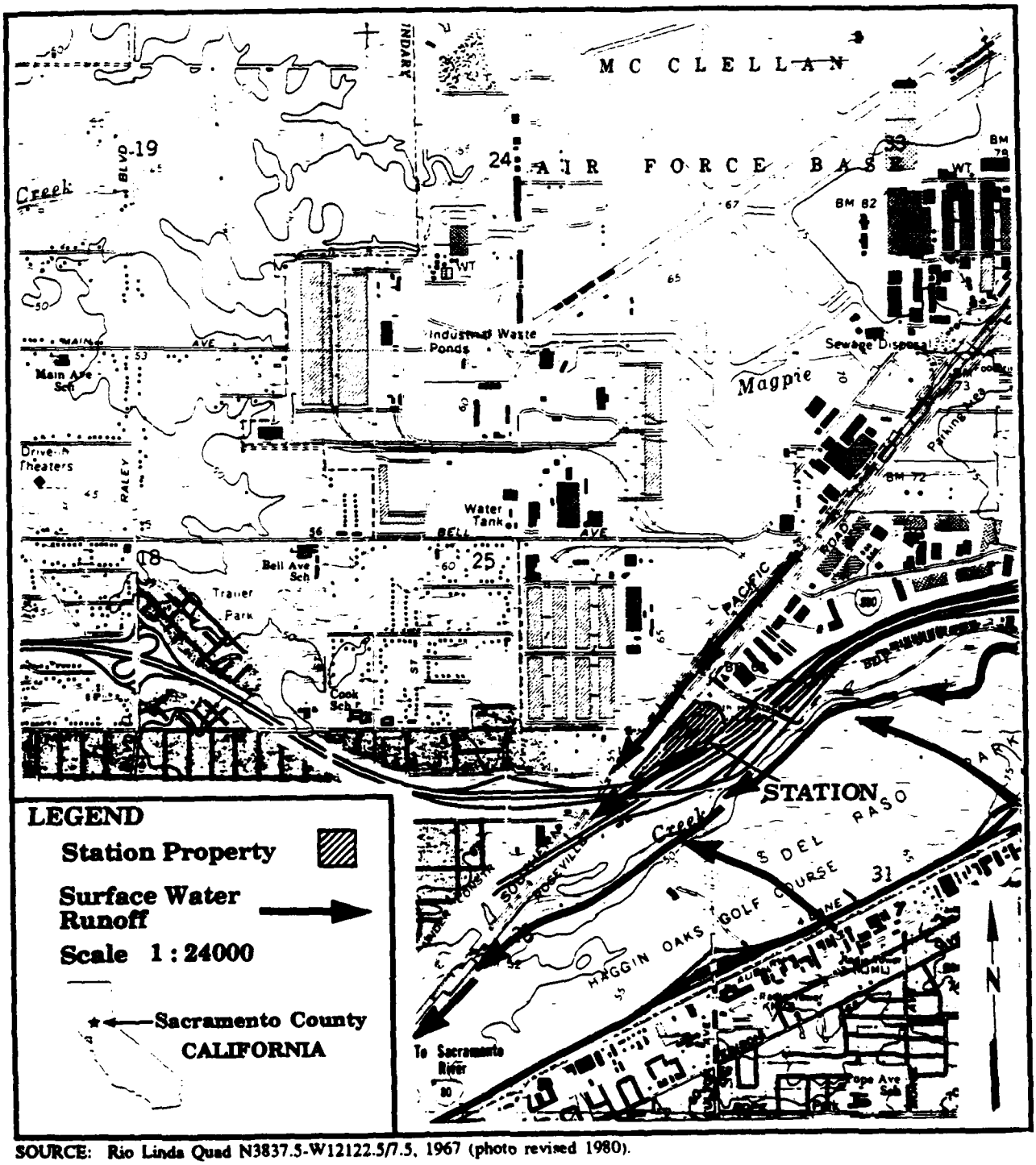
of the Sacramento Valley, California



SOURCE: North Highlands ANGS Base Plans.

Figure III.5

Drainage Map
of the North Highlands Air National Guard Station



SOURCE: Rio Linda Quad N3837.5-W12122.5/7.5, 1967 (photo revised 1980).

Figure III.6

Surface Water Runoff Route Map of the Area

2. Groundwater

According to Poland and Evenson, 1966, the aquifers containing fresh groundwaters are principally heterogenous, unconsolidated, continental deposits (chiefly Alluvium) of Pliocene to Recent age. These deposits range in depth from less than 100 to more than 3500 feet.

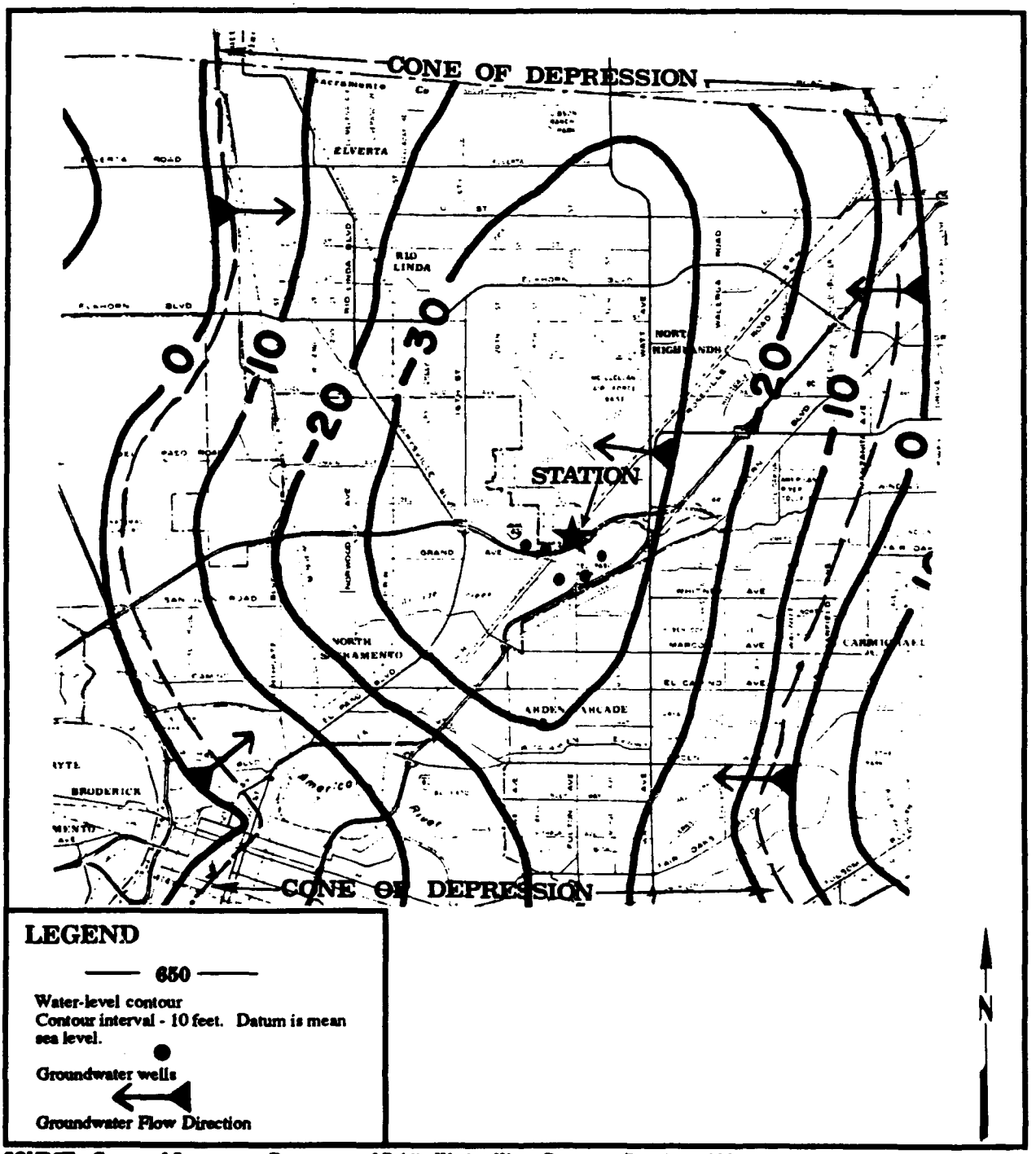
Overall, the groundwater in both the confined and unconfined aquifers in the vicinity of the Station moves from the flanks toward the axis (from east to west) and then southward out of the Sacramento Valley toward the delta area at the confluence of the San Joaquin and Sacramento Rivers. In general, most of the confinement of groundwater occurs near the axis of the valley as a result of more extensive confining beds. Because the flanks of the valley are higher than its axis, recharge from tributary rivers and streams (like the Sacramento, American and Arcade), as well as from excess irrigation return, has caused heads in the groundwater along the flanks (east of the Station) to be higher than those along the axis. Additionally, recharge takes place through infiltration of rainfall and by underflow entering the valley from tributary canyons.

In the Sacramento Valley, water for irrigation, public supply, and industry is obtained primarily from surface-water sources and, in part, from wells. These wells, in general, range in depth from 100 to about 500 feet. All surface water sources are located in the water shed on the western slopes of the Sierra Nevada Mountains which are located to the east/northeast of the Station. In addition to many smaller reservoirs, the two major surface sources in northern California are Folsum Lake (American River, 17 miles east/northeast of the Station) and Shasta Lake (Sacramento River, 180 miles north of the Station).

Original data on water wells drilled in the 1950s in the area of the Station found water levels at average depths of 20 feet above mean sea level at the time of drilling. Groundwater elevation measurements by the Water Resources Division (County of Sacramento) for spring 1989 indicate that the groundwater elevations in the vicinity of the Station are now approximately 30 feet below mean sea level. Therefore, since the 1950s, multi-use withdrawals have lowered water levels approximately 50 to 55 feet in the greater metropolitan Sacramento area creating a cone of depression that is entirely below mean sea level under the Station (Figure III.7).

D. Critical Habitats/Endangered or Threatened Species

According to records maintained by the California Department of Game and Fish, Natural Diversity Data Base (NDDB), no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the Station.



SOURCE: County of Sacramento, Department of Public Works, Water Resources Division, 1989.

Figure III.7

Groundwater Elevations

Sacramento County, California, Spring 1989

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, disposed of, and processed. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Station. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

Fresh product diesel fuel and MOGAS are stored in underground storage tanks at the Station. In addition, tank trucks and fuel trailers parked at the Station are used to store fuels. The 162nd CCGP and the 149th CCSQ generate hazardous wastes primarily through vehicle and AGE maintenance operations.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Nine persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. Two potentially contaminated sites were identified through the interviews. These site identifications were followed-up by visual field examinations of the sites. Each of these sites was rated by application of the United States Air Force (USAF) HARM, and since the potential for contaminant migration exists at these two potential sites, each is recommended for further investigation under the IRP program. Copies of completed HARM forms and an explanation of the factor rating criteria used for sites scoring are contained in Appendix C.

Contaminants that may have been released at each of the two rated sites have the potential to be transported by groundwater and surface water. The water table is 11 to 50 feet below the ground surface at the Station. If the shallow groundwater becomes contaminated by hazardous wastes, then, under certain circumstances, the deeper aquifers may also be contaminated by groundwater migration. Released contaminants that are exposed on the ground surface have the potential to be transported by surface waste migration into Arcade Creek.

Locations for the two sites are provided on Figure IV.1. The following items are descriptions of the two potential sites identified at the Station:

Table IV.1

Hazardous Materials/Hazardous Wastes Disposal Summary: North Highlands Air National Guard Station, Sacramento, California.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1950	1960	1970	1980	1990
Vehicle Maintenance (Bldg. 4)	Engine Oil	200	CONTR/DRMO				
	PD-680	50	CONTR/DRMO				NLU
	Battery Acid	20	CONTR/DRMO				
	Ethylene Glycol	100	CONTR/DRMO				
	Hydraulic Oil	50	CONTR/DRMO				
	Transmission Fluid	25	CONTR/DRMO				
	Paint Thinner	45	CONTR/DRMO				
	Brake Fluid	20	CONTR/DRMO				
	Diesel Fuel	100	CONTR/DRMO				
	Safety Kleen	50	NIU				CONTR
	MEK	3	PROC				
	Cleaning Compound	50	WASH				
	Enamel Paint	20	CONTR/DRMO				NLU

KEY:

CONTR - Disposed of through a Contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
GRND - Material disposed on the ground or poured along fencelines for weed control.
NIU - Material not in use.
NLU - Material no longer used.
PROC - Material used up in process (ie. evaporation).
TRASH - Disposed of in trash which goes to City landfill.
WASH - Disposed in drains at washrack during washing operations. Water at the washrack drains into an oil/water separator and then into the sanitary sewer.

Table IV.1

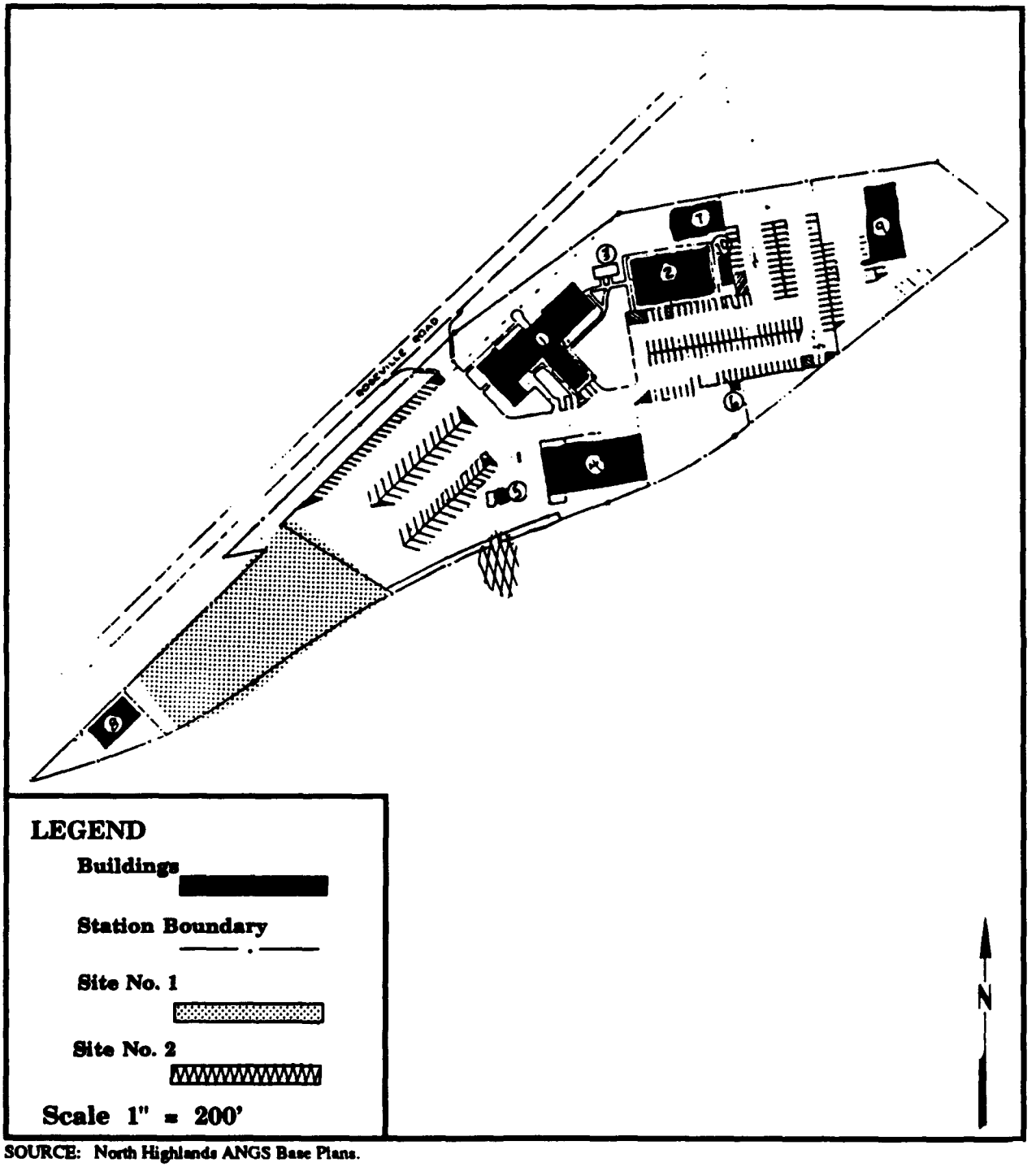
Hazardous Materials/Hazardous Wastes Disposal Summary: North Highlands Air National Guard Station, Sacramento, California (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal
			1950 1960 1970 1980 1990
Aerospace Ground Equipment (AGE) Maintenance (Bldg. 9**)	Engine Oil	60	GRND/CONTR/DRMO
	Strippers/Thinners	30	GRND/CONTR/DRMO
	PD-680	100	CONTR/GRND / NLU
	Gasoline	30	GRND/CONTR/DRMO
	Battery Acid	100	GRND / DRMO
	Cleaning Compound	110	WASH
	MEK	20	PROC/TRASH / NLU
	Stoddard Solvent		GRND/CONTR/DRMO / NLU
	Safety Kleen	100	NIU / CONTR
	Diesel Fuel	55	GRND/CONTR/DRMO
	Enamel Paint	15	GRND/CONTR/DRMO
	Hydraulic Oil	20	NIU / DRMO / NLU
	JP-4	20	NIU / CONTR / NLU

** Building 2 was constructed in 1980. Prior to its construction, maintenance operations were conducted in a gravel area west of Building 1. Wastes resulting from these operations were largely collected and disposed along with wastes from vehicle maintenance.

KEY:

- **CONTR** - Disposed of through a Contractor.
- **DRMO** - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
- **GRND** - Material disposed on the ground or poured along fencelines for weed control.
- **NIU** - Material not in use.
- **NLU** - Material no longer used.
- **PROC** - Material used up in process (ie. evaporation).
- **TRASH** - Disposed of in trash which goes to City landfill.
- **WASH** - Disposed in drains at washrack during washing operations. Water at the washrack drains into an oil/water separator and then into the sanitary sewer.



SOURCE: North Highlands ANGS Base Plans.

Figure IV.1

Potential Sites

at the North Highlands Air National Guard Station

Site No. 1 - Old AGE Area (HAS - 58)

The Old AGE Area is located on the west side of the Station. It is covered with sandy soil and is the present location of the Station's antenna. The initial site visit revealed no noticeable soil staining. This area was used predominantly for the maintenance of ground equipment, including vehicles and generators from the early 1960s until 1980, when the new AGE Shop was constructed. This site is approximately 100 feet wide and extends approximately 300 feet (Figure IV.1). These maintenance operations resulted in frequent releases of small amounts of waste oils, solvents, fuels, paints, and thinners. Interviewees reported that waste oil was often poured directly onto the ground. Releases of materials in this area drained directly into the ground because of the high permeability of the soils in this area.

Since a potential for soil and groundwater contamination exists, a HAS was calculated for this potential site. No exact quantities are known to have been released in this area. Based on the small amounts of materials generated by the AGE Shop, a small quantity has been assigned to this site. According to HARM, a small quantity is less than 20 drums (1100 gallons). In addition, because of the nature of the solvents disposed, a high hazard rating will be assigned to the site of the Old AGE Area.

Site No. 2 - Area Behind Vehicle Maintenance (HAS - 58)

Interviewees reported that the area behind the current Vehicle Maintenance Shop (Building No. 4) was occasionally used to dispose of small amounts of waste solvents, paints, and thinners. These materials were periodically poured along the boundary fence from the late 1950s through the mid 1960s.

The old drainage area is included as part of this site. Nearly all surface water on the Station property drained into a centrally located area off the property behind the Vehicle Maintenance Shop. The majority of spills or releases of hazardous materials would drain to this general drainage area that was reported to be about 20-30 feet south of the Station's property. This area was either covered over or removed completely when the freeway was constructed in 1968. However, just beyond the original drainage area an access road has been constructed, and, as a result, it is not known whether the original soils are still present. If the original soil in the area was not disturbed, then it is covered by at least 10-20 feet of fill dirt.

This site covers an area 40 feet along the fenceline and extends to the drainage area that is approximately 30 feet south of the Station property (Figure IV.1). The initial site visit revealed no noticeable stressed vegetation or stained soil at Site No. 2.

In conjunction with construction of the freeway, a concrete drainage ditch for surface water was constructed. It drains around the perimeter of the Station and empties into the city sewer.

Since there is a potential for soil and groundwater contamination from disposal of these wastes, a HAS was calculated for the site. Because only small quantities are known to have been periodically disposed of at this site, a small quantity according to HARM is assigned. In addition, a high hazard rating is assigned to this site because solvents were reported to have been disposed of in this area.

C. Other Pertinent Facts

- Trash and non-hazardous solid wastes are disposed of by a contractor.
- There is no Polychlorinated Biphenyl (PCB) electrical equipment at the station.
- The potable water supply for the Station is provided by McClellan AFB. No water wells are present within the Station's boundaries. The nearest water well is approximately 30 feet outside the Station's boundary just north of Building No. 7.
- Sanitary sewer services for the Station are provided by the Water Works and Sanitary Sewer Board of the city of Sacramento.
- McClellan AFB is listed as a NPL site; consequently, investigative and remedial work is ongoing. McClellan AFB is along trend with and just north of the Station. Both McClellan AFB and the Station are situated above the same aquifer, and the groundwater flow is generally east to west.
- There are no known leaking or abandoned underground storage tanks at the Station.
- There are two oil/water separators located at the Station. Both separators are made of concrete and have a 500-gallon capacity. One separator is located at Building No. 4 and was installed in 1979. The other was installed at Building No. 9 in 1973. Both separators are connected to the sanitary sewer system.

V. CONCLUSIONS

Information obtained through interviews with nine present and past Station personnel, reviews of Station records, and field observations resulted in the identification of two potentially contaminated disposal and/or spill sites on Station property. These potential sites are as follows:

Site No. 1 - Old AGE Area (HAS - 58)

Site No. 2 - Area Behind Vehicle Maintenance (HAS - 58)

Each of these sites exhibit the potential for contaminant migration through surface water, soil, and/or groundwater.

VI. RECOMMENDATIONS

The PA identified two potentially contaminated sites. As a result, additional investigation under the IRP is recommended for these sites to confirm the presence or absence of contamination.

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GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium or deposited by a stream or running water.

ALLUVIAL FAN - An outspread, gently sloping mass of alluvium deposited by a stream, especially in an arid or semiarid region where a stream issues from a narrow canyon onto a plain or valley floor.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUIFER - A water-bearing layer of rock that will yield water in a usable quantity to a well or spring.

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

ARGILLACEOUS - Like or containing clay.

ARKOSE - A feldspar rich sandstone, typically coarse-grained and pink or reddish, that is composed of angular to subangular grains that may be either poorly or moderately well-sorted, is usually derived from the rapid disintegration of granite or granitic rocks, and often closely resembles granite.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the consolidated (solid) rock that underlies soil or other unconsolidated superficial material. See HORIZON [soil] - *R layer.*

BERM - A ledge or space between the ditch and parapet in a fortification.

CLASTIC - Rock or sediments composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their place or origin source.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

COARSE-TEXTURED (light textured) SOIL - Sand or loamy sand.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under

the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CONTEMPORANEOUS FAULT - See GROWTH FAULT.

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIABASE - An intrusive rock whose main components are labradorite and pyroxene and which is characterized by ophitic texture.

DIORITE - A group of igneous rocks composed of dark-colored amphibole (esp. hornblende) oligoclase, andesine, pyroxene, and small amounts of quartz; the intrusive equivalent of andesite.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are

shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well-drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured and mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water drains or moves.

DRAWDOWN - The reduction in head at a point caused by the withdrawal of water from an aquifer.

EMBAYMENT - A downwarped region of stratified rocks that extends into a region of other rocks.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the

Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

EUGEOSYNCLINAL - Like a geosyncline in which volcanism is associated with clastic sedimentation.

EUSALINE - Sodium chloride concentrations of 30 to 35 parts per thousand. Same as normal sea water.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FELDSPAR - Any of several crystalline minerals made up of Aluminum silicates with sodium, potassium, or calcium; most widespread of any mineral group and constitute 60% of the earth's crust; occur in all types of rock.

FELDSPATHIC - Like or as feldspar.

FINE-GRAINED - Said of a soil in which silt and/or clay predominate.

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GABBRO - A group of dark-colored, basic intrusive igneous rocks composed principally of basic plagioclase and clinopyroxene, with or without olivine and othoxypyrene; approximate intrusive equivalent of basalt.

GEOLOGIC TIME - See Figure Gl.1.

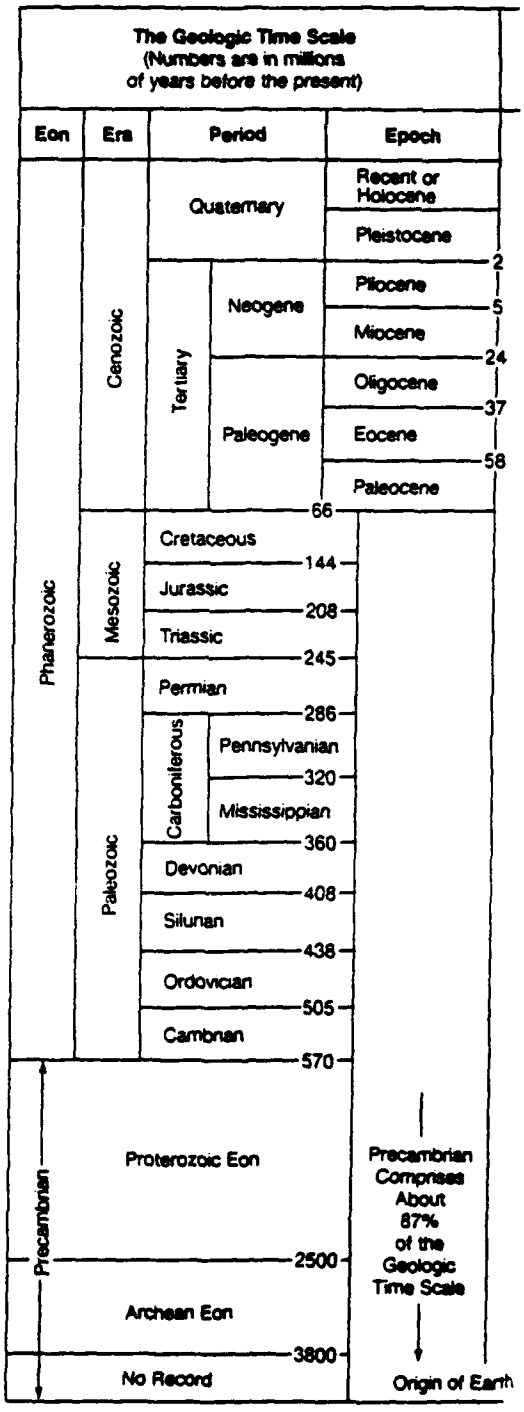

Figure Gl.1

The Geologic Time Scale

GNEISS - A coarse-grained, foliated rock produced by regional metamorphism; commonly feldspar- and quartz-rich.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase, and potassium feldspar with biotite, hornblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GRAYWACKE - A non-porous, dark-colored sandstone containing angular grains and fragments of other rocks; a fine-grained conglomerate resembling sandstone.

GROUNDWATER - Water in the saturated zone that is under a pressure equal to or greater than atmospheric pressure.

GROWTH FAULT - A fault in sedimentary rock that forms contemporaneously and continuously with deposition, so that the displacement (throw) increases with depth and the strata of the downthrown side are thicker than the correlative strata of the upthrown side.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, December 11, 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazard Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HEAD - See TOTAL HEAD.

HERBICIDE - A weed killer.

HIGHLAND - A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; and mountainous region.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

HORIZON [soil] - A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon - An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon - The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon - A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon - The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic of blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon - The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties

typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer - Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

HORST - An elongate, relatively uplifted crustal unit or block that is bounded by faults on its long side.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

LOWLAND - A general term for low-lying land or an extensive region of low land, esp. near the coast and including the extended plains or country lying not far above tide level.

MEANDERBELT - The zone along a valley floor across which a meandering stream shifts its channel from time to time.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEAN SEA LEVEL - The average height of the surface of the sea for all stages of the tide over a 19-year period.

MESA - A table-land; a flat-topped mountain or plateau bounded on at least one side by a steep cliff.

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MONTMORILLONITE - A clay mineral of the smectite group comprising expanding-lattice clay minerals when wetted.

MONZONITE - Plutonic rock intermediate in composition between syenite and diorite, containing approximately equal amounts of alkali feldspar and plagioclase.

MOTTLED [soil] - a soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

NET PRECIPITATION - Precipitation minus evaporation.

ORTHOCLASE - See FELDSPAR.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

OVERTURNED - Said of a fold or the limb of a fold, that has tilted beyond the perpendicular. Sequence of strata thus appears reversed.

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stoddard solvent.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content (at least 75%).

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure - see SOIL PERMEABILITY.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The voids or openings in a rock. Porosity may be expressed quantitatively as the ratio of the volume of openings in a rock to the total volume of the rock.

POTENTIOMETRIC SURFACE - A surface that represents the total head in an aquifer; that is, it represents the height above a datum plane at which the water level stands in tightly cased wells that penetrate the aquifer.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline or crystalline masses. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

QUARTZITE [meta] - A granoblastic metamorphic rock consisting mainly of quartz and formed by recrystallization of sandstone or chert by either regional or thermal metamorphism.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SALINE [adj] - Salty; containing dissolved sodium chloride.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular fragments of sand, size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SATURATED ZONE - The subsurface zone in which all openings are full of water.

SCHIST - A medium- or coarse-grained, strongly foliated, crystalline rock; formed by dynamic metamorphism.

SEDIMENT - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SEDIMENTARY ROCK - A rock resulting in the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SIALIC - Like the light, granitic rock material near the surface of the earth's crust, underlying the continents.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SOIL - The layer of material at the land surface that supports plant growth.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as the distance per unit time that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	-	less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	-	0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	-	0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	-	0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	-	2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	-	6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid - more than 20.00 inches per hour (more than 1.41 x 10^{-2} cm/sec)

(Reference: United States Department of Agriculture, Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests at pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - See STRUCTURE [soil].

SOLUM - The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum. See HORIZON [soil].

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

STRAND PLAIN - A prograded shore built seaward by waves and currents, and continuous for some distance along the coast.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRIKE - SLIP FAULT - A fault on which the movement is parallel to the fault's strike. See TRANSCURRENT FAULT.

STRUCTURE [soil] - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are - platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SUBSIDENCE - Sinking or downward settling of the earth's surface, not restricted in rate, magnitude, or area involved.

SUBSOIL - Technically, the B horizon; roughly, the part of the solum below plow depth.

SUBSOILING - Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

SUBSTRATUM - The part of the soil below the solum.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SYENITE - Plutonic rock containing orthoclase and microcline with small amounts of plagioclase feldspar.

SYNCLINORIUM - A composite synclinal structure of regional extent composed of lesser folds.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.

TERRIGENOUS DEPOSITS - Shallow marine sediment consisting of material eroded from the land surface.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or significant portion of its range.

TIME [geol] - See Figure Gl.1.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

TOTAL HEAD - The height above a datum plane of a column of water. In a groundwater system, it is composed of elevation head, pressure head, and velocity head.

TRANSCURRENT FAULT - A large scale strike - slip fault in which the fault surface is steeply inclined.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

UNDULATING [geomorph] - (a) A landform having a wavy outline or form. (b) A rippling or scalloped land surface, having a wavy outline or appearance.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

WATER TABLE - The level in the saturated zone at which the pressure is equal to the atmospheric pressure.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) City of Sacramento
Department of Community Planning and Development
Suite 300
Sacramento, CA 95814
Gary Ziegensut
(916) 449-5381

2) County of Sacramento
Department of Public Works
Water Resources Division
827 7th Street, Room 301
Sacramento, CA 95814

3) Department of Water Resources
Central District
3251 South Street
Sacramento, CA 95816-70117
Howard L. Mann, Chief
Surface and Ground Water Data Section

4) McClellan Air Force Base
Environmental Restoration Division
Environmental Management
North Highlands, CA 95652-5990
Bud Hoda
(916) 643-1250

5) Soil Conservation Service
1560 Catalina Street
Livermore, CA 94550
Lois Tillman
(415) 447-0749

6) State of California
Department of Fish and Game
P.O Box 944290
Sacramento, CA 94244-2090
(916) 324-3812

OUTSIDE AGENCY CONTACT LIST (continued)

7) State of California
Resources Agency
Department of Conservation
California Division of Mines and Geology
P.O. Box 2980
Sacramento, CA 95812
Karen Fleming
(916) 324-3812

8) State of California
Resources Agency
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

9) Timely Discount Topos Inc.
9769 West 119th Drive, Suite 9
Broomfield, Colorado 80020
(303) 469-5022

10) United States Department of Agriculture
Soil Conservation Service
65 Quinta Court, Suite C
Sacramento, CA 95823
(916) 682-7844

11) United States Department of Agriculture
Soil Conservation Service
805 West Avenue J
Lancaster, CA 93534
Richard Campbell
(805) 945-2604

12) United States Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data and Information Service
National Climatic Center
Asheville, NC 28801
(704) 259-0871

13) United States Geological Survey
Books and Open File Reports Section
P.O. Box 25425 DFC, Building 810
Denver, CO 80225

OUTSIDE AGENCY CONTACT LIST (continued)

14) United States Geological Survey
300 North Los Angeles Street
Los Angeles, CA 90012
Dianne Noserale
(213) 894-2850

15) United States Geological Survey
745 Middle Field Road
Mail Stop 532
Menlow Park, CA 940253

16) United States Geological Survey
Water Resources Division
California District
2800 Cottageway, Room W-2235
Sacramento, CA 95825
Jean F. Lucas
(916) 978-4668

Appendix B

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The DoD has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques at DoD facilities. One of the actions required under this program is to:

> Develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, December 11, 1981).

Accordingly, the USAF has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the PA phase of the IRP.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-up site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous waste present in sufficient quantity), and (2) potential for migration exists. A site may be deleted from ranking consideration on either basis.

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the USAF's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors presented in this appendix. The site rating form and the rating factor guidelines are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contaminant migration, and (4) any effort that was made to contain the waste resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score while scores for solids are reduced.

The pathways category rating is based on evidence of contaminant migration along one of three pathways: surface water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well-managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the score for the other three categories.

HAZARD ASSESSMENT RATING FORM

NAME OF SITE

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site		4		12
B. Distance to nearest well		10		30
C. Land use-zoning within 1-mile radius		3		9
D. Distance to installation boundary		6		18
E. Critical environments within 1-mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Groundwater use of uppermost aquifer		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by groundwater supply within 3 miles of site		6		18
		Subtotals	_____	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal)

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) _____
2. Confidence level (C = confirmed, S = suspected) _____
3. Hazard rating (H = high, M = medium, L = low) _____

Factor Subscore A (from 20 to 100 based on factor score matrix)

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

_____ x _____ = _____

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

_____ x _____ =

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore [redacted]

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24

Subtotals _____ 108

Subscore (100 x factor score subtotal/maximum score subtotal) [redacted]

2. Flooding		1		3

Subscore (100 x factor score/3) [redacted]

3. Groundwater migration

Depth to groundwater		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to groundwater		8		24

Subtotals _____ 114

Subscore (100 x factor score subtotal/maximum score subtotal) [redacted]

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore [redacted]

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors
Waste Characteristics
Pathways

Total _____ divided by 3 = _____

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

_____ x _____ = [redacted]

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- Verbal reports from interviewer (at least 2) or written information from the records
- Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- No verbal reports or conflicting verbal reports and no written information from the records
- Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels			
	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
	S	C	H
60	M	C	M
	L	S	M
	L	C	L
50	M	S	H
	S	C	M
	S	S	H
	M	S	M
40	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCM = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical state	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- Clay cap or other impermeable cover
- Leachate collection system
- Liners in good condition
- Adequate monitoring wells

Surface Impoundments:

- Liners in good condition
- Sound dikes and adequate freeboard
- Adequate monitoring wells

Spills:

- Quick spill cleanup action taken
- Contaminated soil removed
- Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- Concrete surface and berms
- Oil/water separator for pretreatment of runoff
- Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix C

Site Hazard Assessment Rating Forms and Factor Rating Criteria

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: Site No. 1 - Old AGE Area

LOCATION: Approximately 300 feet southwest of Building 1 (Headquarters)

DATE OF OPERATION OR OCCURRENCE: 1960s - 1980

OWNER/OPERATOR: North Highlands Air National Guard

COMMENTS/DESCRIPTION: Waste fuels, oils, paints, etc., were periodically disposed of at this site.

SITE RATED BY: Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	135	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal): 75

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large): S
2. Confidence level (C = confirmed, S = suspected): C
3. Hazard rating (H = high, M = medium, L = low): H

Factor Subscore A (from 20 to 100 based on factor score matrix): 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108

Subscore (100 x factor score subtotal/maximum score subtotal) 50

2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Depth to groundwater	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
		Subtotals	40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	75
Waste Characteristics	48
Pathways	50
Total 173 divided by 3 =	58
	Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: Site No. 2 - Area Behind Vehicle Maintenance

LOCATION: South of Building 4 (Vehicle Maintenance)

DATE OF OPERATION OR OCCURRENCE: 1950 thru the late 1960s

OWNER/OPERATOR: North Highlands Air National Guard

COMMENTS/DESCRIPTION: Waste fuels, oils, paints, etc., were periodically disposed of at this site.

SITE RATED BY: Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	135	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal): 75

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large): S
2. Confidence level (C = confirmed, S = suspected): C
3. Hazard rating (H = high, M = medium, L = low): H

Factor Subscore A (from 20 to 100 based on factor score matrix): 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108

Subscore (100 x factor score subtotal/maximum score subtotal) 50

2. Flooding

	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Depth to groundwater	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
		Subtotals	40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	75
Waste Characteristics	48
Pathways	50
Total 173 divided by 3 =	58
	Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

North Highlands Air National Guard Station
North Highlands, California

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

The following is an explanation of the HARM factor rating criteria for each of the two potential sites.

I. Receptors

A. Population Within 1000 feet of Site.

Site Nos. 1 and 2, Factor Rating 3.
The population within 1000 feet of both sites is over 100. On UTA weekends, the station population is approximately 240 persons.

B. Distance to Nearest Water Well.

Site Nos. 1 and 2, Factor Rating 3.
There is a water well located just off Station property, south of Building 5. It is approximately 800 feet from Site No. 1 and 600 feet from Site No. 2.

C. Land Use-Zoning (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 3.
The area within a 1-mile radius of both sites is zoned commercial and residential.

D. Distance to Installation Boundary.

Site Nos. 1 and 2, Factor Rating 3.
Both sites are located adjacent to the Station's boundary. Site No. 1 includes an area along the south perimeter fence. Site No. 2 includes portions of the north and south perimeter fence.

E. Critical Environments (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 3.
The entire station and the potential sites on it are positioned above a major recharge area into Arcade Creek.

F. **Water Quality/Use Designation of Nearest Surface Water Body.**

Site Nos. 1 and 2, Factor Rating 0.
Arcade Creek is primarily used for agricultural or industrial purposes.

G. **Groundwater Use of Uppermost Aquifer.**

Site Nos. 1 and 2, Factor Rating 2.
The groundwater is used for drinking water; however, municipal water is available in the North Highlands area.

H. **Population Served by Surface Water Supplies Within 3 miles Downstream of Site.**

Site Nos. 1 and 2, Factor Rating 0.
The local population is supplied with water from aquifers.

I. **Population Served by Aquifer Supplies Within 3 miles Downstream of Site.**

Site Nos. 1 and 2, Factor Rating 3.
Over 1000 persons within a 3-mile radius of each potential site are served by aquifer supplies.

II. Waste Characteristics

Site No. 1

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
A small quantity, less than 20 drums, of combined wastes is estimated to have been disposed of at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Several interviewees reported that wastes were periodically spilled or poured out at this potential site.

A-3: Hazard Rating - Factor Rating H (High).
A high hazard rating was assigned because of the high toxicity of the fuels and solvents disposed of at this site.

Site No. 2

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
It is estimated that only a small quantity (less than 20 drums) of fuels, oils, solvents, paints, or thinners had been disposed of at this potential site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Several interviewees reported that wastes had been periodically spilled or poured out at this potential site.

A-3: Hazard Rating - Factor Rating H (High).
This site was given a high hazard rating because of the high toxicity of the materials released throughout its area.

B. Persistence Multiplier for Point Rating.

Site Nos. 1 and 2 were assigned a persistence multiplier of 0.8 based on the presence of waste petroleum products such as engine oil, hydraulic oil, and fuels. These wastes correspond primarily to the HARM category of "Straight Chain Hydrocarbons."

C. Physical State Multiplier.

A physical state multiplier of 1.0 was applied to both sites because the substances released were liquids.

III. Pathways Category

A. Evidence of Contamination.

Site Nos. 1 and 2 were given a score of 0 (no evidence) because there was no noticeable vegetation stress or soil staining and the potential sites are not greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination.

- Distance to Nearest Surface Water: Factor Rating 3.
  Site Nos. 1 and 2 are located within 500 feet of drainage ditches and storm sewers.

- Net Precipitation: Factor Rating 0.
  The average annual net precipitation is approximately -34 inches for both sites.

- Surface Erosion: Factor Rating 1.
  There is slight erosion of soil at Site Nos. 1 and 2.

- Surface Permeability: Factor Rating 1.
  The surface permeability at Site Nos. 1 and 2 is in the range of 10^{-4} to 10^{-2} cm/sec.

- o Rainfall Intensity Based on 1-year, 24-hour Rainfall: Factor Rating 2.
  The rainfall intensity in the Station area is approximately 2.25 inches.

B-2 Potential for Flooding. Factor Rating 0.
Site Nos. 1 and 2 are located beyond the 100-year flood plain of local streams.

B-3 Potential for Groundwater Contamination.

- o Depth to Groundwater: Factor Rating 2.
  The depth to groundwater at Site Nos. 1 and 2 is 11 to 50 feet.

- o Net Precipitation: Factor Rating 0.
  See B-1.

- o Soil Permeability: Factor Rating 2.
  At Site Nos. 1 and 2, the permeability is in the range of 10^{-4} to 10^{-2} cm/sec.

- o Subsurface Flows: Factor Rating 0.
  The bottoms of Site Nos. 1 and 2 are greater than 5 feet above high groundwater level.

- o Direct Access to Groundwater: Factor Rating 1.
  Direct access to groundwater through faults, fractures, faulty well casings, subsidence, etc., is low risk for Site Nos. 1 and 2.

IV. Waste Management Practices Factor

A multiplier of 1.0 is applied to Site Nos. 1 and 2 because neither has any form of containment.